

State of California  
The Resources Agency  
DEPARTMENT OF WATER RESOURCES  
Northern District

RECREATION USE SURVEY OF  
INDIAN CREEK, PLUMAS COUNTY  
1990

Technical Information Report No. 90-1

Prepared under the supervision of

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by

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This report was prepared to summarize information collected under Work Order 1501-0100 to document recreation and fishery enhancement provided by a revised operation of Antelope Reservoir. This report has received only limited review; it is intended for internal use and should be considered preliminary and subject to revision.

December 1990

## CONTENTS

	<u>Page</u>
SUMMARY . . . . .	1
DESCRIPTION OF STUDY AREA . . . . .	2
METHODS . . . . .	5
Recreation Use Counts . . . . .	5
Creel Census . . . . .	5
RESULTS . . . . .	6
Recreation Use . . . . .	6
Creel Census Data and Angler Success . . . . .	7
DISCUSSION . . . . .	11
Limitations of Use Counts and Creel Census . . . . .	11
Comparison of 1990 Results with Previous Surveys . . . . .	11
ACKNOWLEDGEMENTS . . . . .	15
REFERENCES . . . . .	16

## TABLES

1	Recreation Hours by Activity, Indian Creek, Antelope Dam to Shim Flat-1990 . . . . .	6
2	Estimated Recreation Hours by Activity, Upper Indian Creek, 1978-82, 1986 and 1990 . . . . .	12
3	Streamflow and Estimated Angler Use and Catch, Upper Indian Creek, 1978-82, 1986 and 1990 . . . . .	13

## FIGURES

1	Antelope Reservoir and Indian Creek, Plumas County, 1990 . . . . .	3
2	Indian Creek Visitor Origin by County Groups, 1990 . . . . .	8
3	Indian Creek Angler Origin by County Groups, 1990 . . . . .	10

## APPENDICES

I	Recreation Survey Schedule for Indian Creek, 1990 . . . . .	18
II	1990 Use Count Schedule for Indian Creek . . . . .	19
III	Length-Frequency of Censused Brown Trout, Indian Creek, 1990 . . . . .	20
IV	Length-Frequency of Censused Rainbow Trout, Indian Creek, 1990 . . . . .	21

## SUMMARY

A survey of streamside recreation along upper Indian Creek, Plumas County, was made in 1990. This survey was made to estimate the amount and types of recreation occurring with augmented flow conditions. The random sample survey combined roving use counts with interviews of anglers to gather information on recreation use, activities, visitor origin, and angler success.

There were an estimated 17,000 hours of recreation use on 17 miles of Indian Creek between Antelope Dam and Shim Flat from April 28 and November 15, 1990. The most frequently observed activities were fishing, camping, relaxing and gold seeking. About 34 percent of the visitors and 43 percent of the anglers lived in the northeast counties of California, mostly Plumas and Lassen Counties. Anglers caught about 2,200 brown trout and 1,950 rainbow trout in 6,600 hours of fishing on the creek.

Total recreation use was less than usual due to public access closures caused by a major salvage logging operation and low flow conditions. However, fishing use and trout catch were more than in previous years of below normal runoff (1979 and 1981).

## DESCRIPTION OF STUDY AREA

Indian Creek is a major tributary of the East Branch North Fork Feather River in Plumas County. The creek flows from Antelope Dam about 38 miles to its confluence with Spanish Creek near the junction of Highways 70 and 89, about 11 miles northwest of Quincy (Figure 1). The area has a rich history of gold mining, ranching, and lumber production. In recent decades, recreation use has increased rapidly, with water-related uses a major attraction. Employment in the area today is divided among services, government, and timber harvesting and processing. Indian and Genesee Valleys support large cattle ranches.

The survey reach included the 17 miles of Indian Creek beginning at Antelope Dam, elevation 4,900 feet, and ending at Shim Flat near Genesee woods, elevation 3,600 feet. The 6-mile Genesee Valley reach was included in 1990 to gather baseline information needed to evaluate a proposed stream rehabilitation project.

Below Antelope Dam, Indian Creek flows through a granitic canyon with stands of pine and fir, but short reaches are often meadowlike. It is closely followed by a paved road with wide pullouts for convenient stream access. A portion of the creek cuts through a deep and rugged canyon, accessible only by foot, before flowing into the upper part of Genesee Valley. All but the lower one mile of this reach is within Plumas National Forest.

Between Flourney Bridge and the mouth of Little Grizzly Creek (Genesee Valley), Indian Creek flows through private ranch lands generally closed to public use. The creek gradient is very low in this reach. Below Little Grizzly Creek, Indian Creek flows through a large wooded flat called Shim Flat, which is U. S. Forest Service property. A dirt road leads across the flat to the creek at several secluded points. Black oak, ponderosa pine, and Douglas fir predominate. The paved county road only occasionally comes within sight of the creek in this reach and there are no developed recreation facilities. The only public access points are at Flourney Bridge, Genesee Bridge, and Shim Flat.

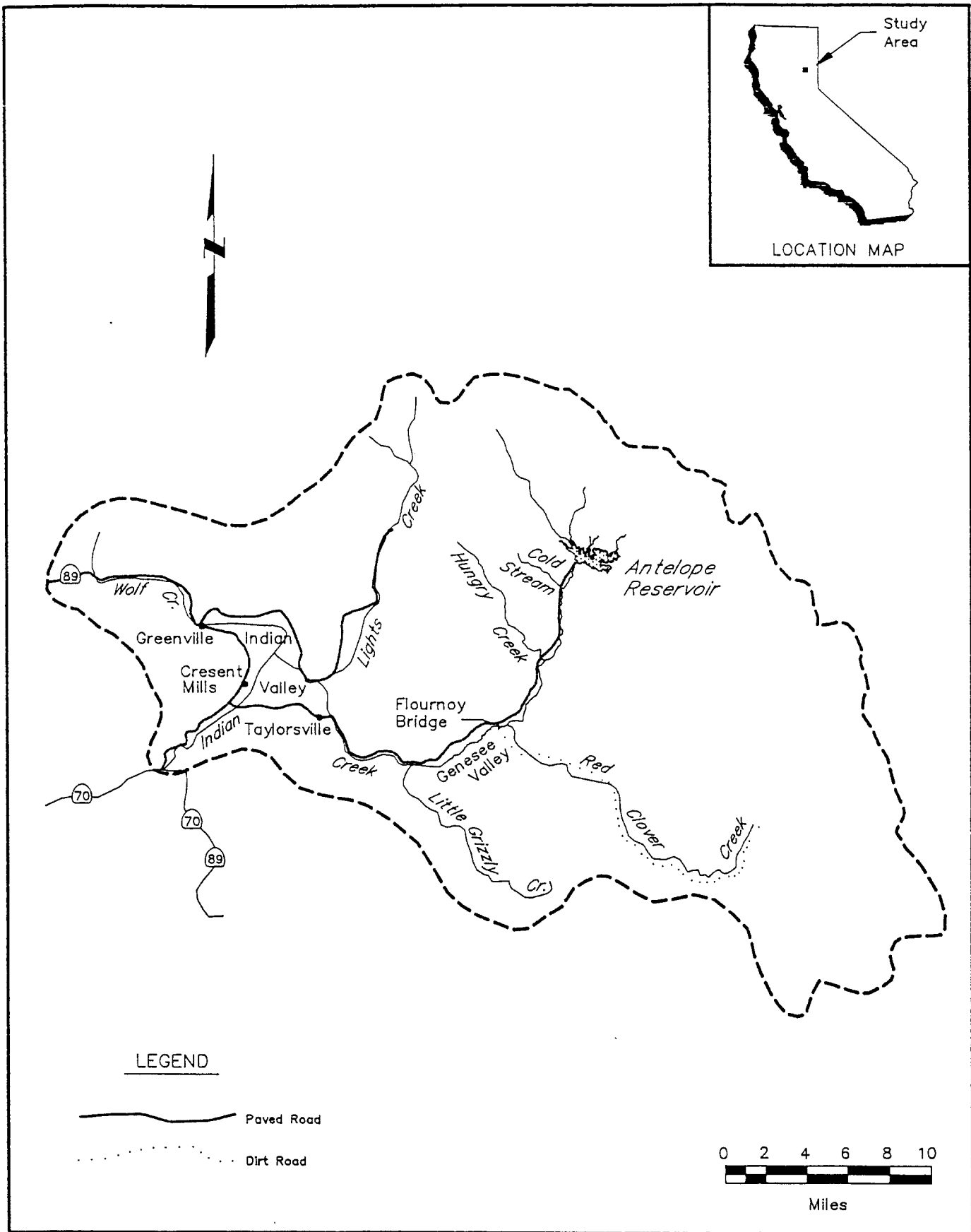


Figure 1 — Antelope Reservoir and Indian Creek,  
Plumas County, 1990

The upper 11 miles of the stream remains cold in summer and is slightly turbid due to deep-water outflow from the dam. Brown trout and rainbow trout dominate the fishery. Many rainbow trout and brown bullhead enter the creek from Antelope Reservoir when it spills. Sacramento squawfish and suckers also occur in the lowermost portion of this reach.

In the 6-mile Genesee Valley reach, Indian Creek is characteristically clear and cool. Typical summer minimum flows average 30 cfs at Flournoy Bridge. This reach has good fishing at times in the early season for rainbow trout, Sacramento squawfish and Sacramento sucker.

Antelope Reservoir did not fill in 1990, and the release was controlled at 10 cfs all year (except 5 days in September when the release was reduced to 5 cfs to permit fish population sampling).

## METHODS

### Recreation Use Counts

Use counts were made on randomly selected dates within nine survey strata using the optimum allocation method described by Abramson and Tolladay (1959). Twenty-nine days of the 202-day period from April 28 through November 15, 1990, were surveyed; both days of the opening weekend of trout season, 5 of 7 holiday weekend days, 13 of 141 weekdays, and 9 of 52 weekend days. Five one-hour counts of recreation use were made in the study area each day at regular periods, scheduled according to the number of daylight hours (Appendices I and II).

The surveys were made from a vehicle or on foot, as necessary, to check access and recreation sites. Recreationists (and their vehicles) were counted and recorded by recreation activity. The five daily counts were totalled and multiplied by factors that accounted for recreation use during the daylight periods not counted. Similarly, the resulting daily figures were expanded to estimate total recreation hours for all days in each stratum. Adding the stratum totals provided an estimate of recreation hours for the study period.

### Creel Census

Anglers along Indian Creek were contacted on 36 days to determine fishing success. The county of residence and length of time spent fishing so far that day was recorded for each angler contacted. Fish censused were counted, measured (fork length to nearest 0.5 centimeter [cm]), and identified to species.

To determine total catch, the catch per hour was multiplied by estimated hours of fishing for each stratum. Total weight of trout caught was calculated from estimated total catch and length-weight data from Indian Creek trout (Bumpass and Smith, 1989C).

## RESULTS

### Recreation Use

Total recreation use on Indian Creek, Antelope Dam to Shim Flat, was estimated at 17,000 recreation hours ( $\pm$  3,500 hours) for the period April 28 to November 15, 1990. Based on counts of recreationists, fishing was the major activity, followed by camping, relaxing, and gold seeking (Table 1). Use counts reflect what recreationists were doing when seen and the number of hours spent on each major activity, but did not provide data on other activities that people pursued at other times during their stay.

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Table 1. Recreation Hours by Activity, Indian Creek,  
Antelope Dam to Shim Flat-1990

<u>Activity</u>	<u>Recreation Hours</u>			<u>Percent</u>
	<u>Upper Indian Creek</u>	<u>Genesee Valley</u>	<u>Total</u>	
Fishing	6,200	400	6,600	39
Camping	5,700	500	6,200	36
Relaxing	1,300	300	1,600	9
Gold Seeking	1,300	0	1,300	8
Miscellaneous*	<u>1,200</u>	<u>100</u>	<u>1,300</u>	<u>8</u>
	15,700	1,300	17,000	100

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\* Includes beach use/swimming, sight seeing, children playing, and picnicking.

In addition to the use counts, 152 interviews of recreationists were conducted during the 1990 season, representing 374 people. The interviews provided more detailed information on activity participation and additional information on visitor characteristics. About 64 percent of the recreationists interviewed said



they fished during their visit to Indian Creek, and about 29 percent said they were relaxing. Other activities included gold seeking (11 percent), swimming or wading (8 percent), picnicking (3 percent), walking for pleasure (2 percent), beach use (2 percent), bicycle, motorcycle or off road vehicle use (2 percent), children playing (2 percent), and sightseeing (1 percent). About 1 percent of the people interviewed mentioned miscellaneous other activities. These percentages total more than 100 percent because many people engage in more than one activity.

About 37 percent of the visitors camped along Indian Creek, 33 percent were day users and returned home at night, and 30 percent stayed overnight somewhere in the area, but not at Indian Creek. Most of these camped at Antelope Reservoir, but a few stayed with friends or relatives in the area, at motels or resorts, private campgrounds, or summer cabins.

As in previous years, most recreational visitors to Indian Creek came from the northeast counties, San Francisco Bay area, and Sacramento Valley (Figure 2).

#### Creel Census Data and Angler Success

During the 1990 trout season, 356 anglers were contacted. They had fished 782 hours, with a recorded catch of 190 brown trout (Salmo trutta) and 119 rainbow trout (Oncorhynchus mykiss). In addition, a total of 136 other trout were reported caught, or reported to have been caught and released. Total angling use was estimated at 6,600 hours ( $\pm$  1,350 hours) or 2,275 angler days, with an estimated catch of 2,200 brown trout and 1,950 rainbow trout. Based on reported catch and release, as many as 1,600 additional trout may have been caught and released. No other species of fish were observed or reported to have been caught this year. Angling use in Genesee Valley, included in the totals above, was estimated at 400 hours (140 angler days) with an estimated catch of 80 brown trout and 120 rainbow trout, plus 100 trout caught and released.

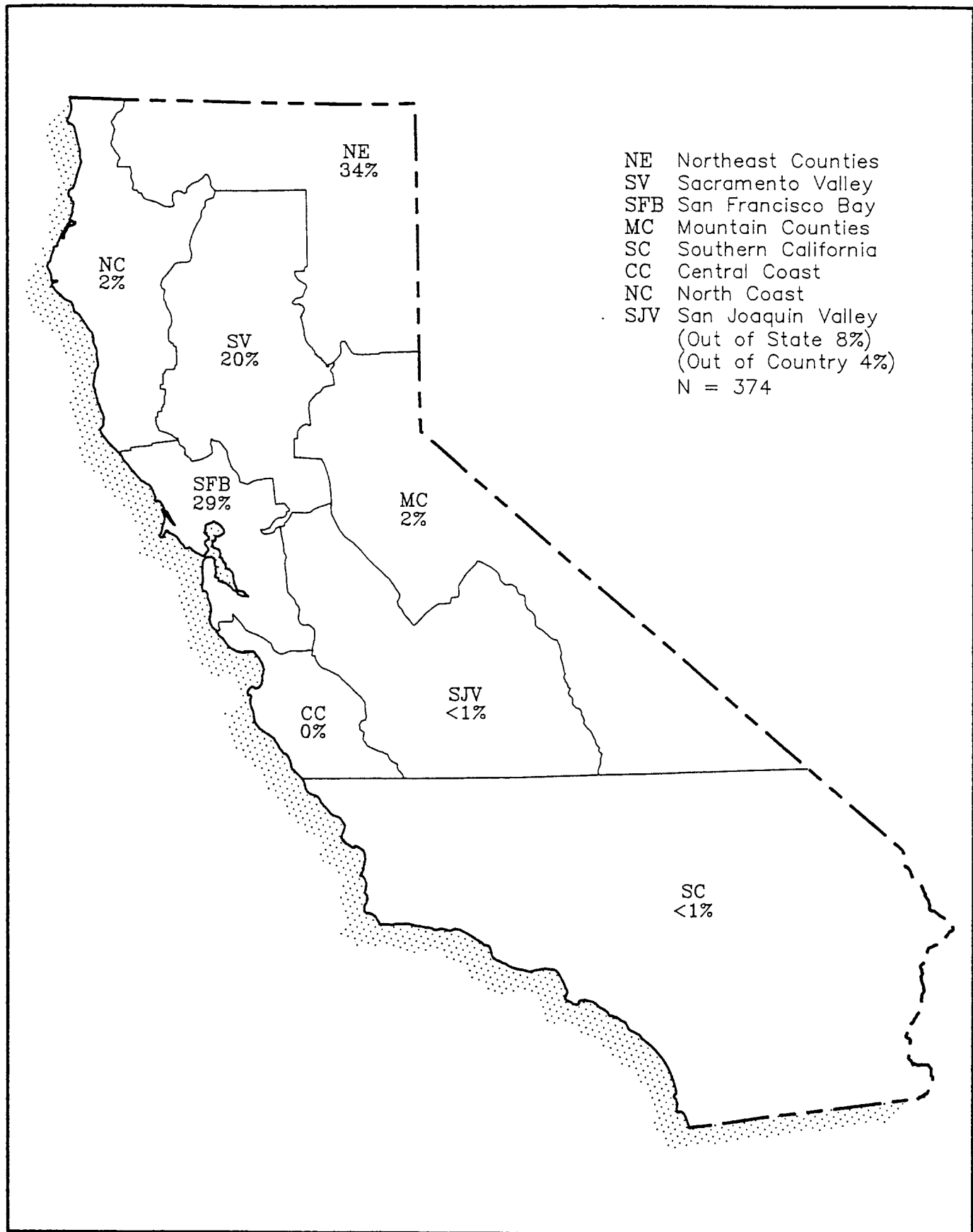


Figure 2 – Indian Creek Visitor Origin By County Groups  
1990

About 35 percent of the anglers censused fished with bait, 14 percent with lures, 11 percent with flies, and about 40 percent fished with some combination of these methods, mostly bait and lures.

The mean length of brown trout caught during 1990 was 23.4 cm (9.2 inches [in]) with a range of 13 to 40 cm (5 to 16 in) (Appendix III). The mean length of rainbow trout was 22.3 cm (8.8 in) with a range of 14.5 to 42.5 cm (6 to 17 in) (Appendix IV). An estimated 700 lb of brown trout and 620 lb of rainbow trout were caught. A brown trout measuring 40.0 cm (15.7 in) and a rainbow trout 42.5 cm (16.7 in) in length were the largest fish observed this year.

Indian Creek angler origin was similar to previous years; most of the anglers came from the northeast counties, San Francisco Bay area, and Sacramento Valley (Figure 3).

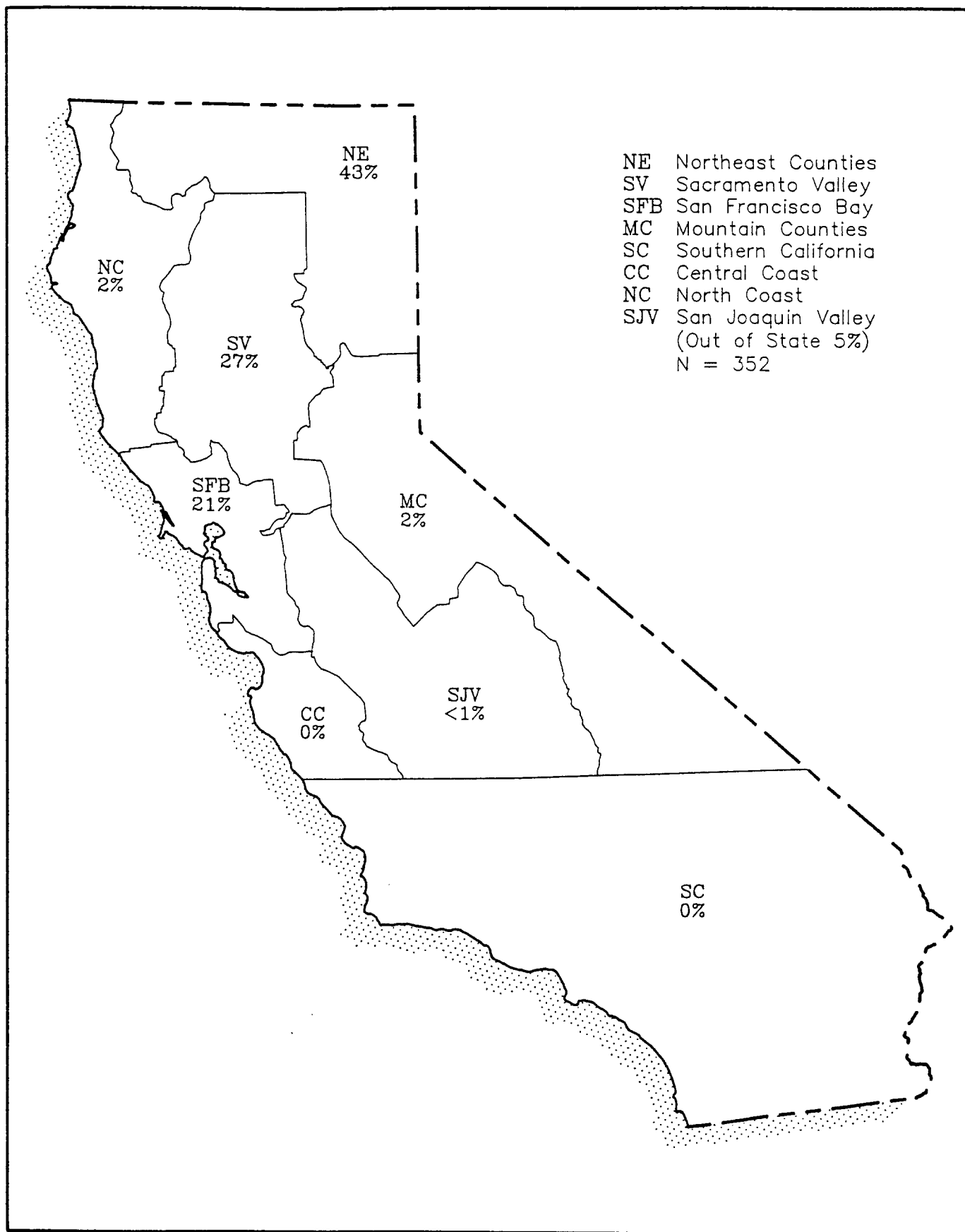


Figure 3 — Indian Creek Angler Origin by County Groups  
1990

## DISCUSSION

Understanding the limitations of the recreation use survey and creel census helps put the data obtained in perspective. This section describes the survey limitations and compares data from previous years with 1990 data.

### Limitations of Use Counts and Creel Census

Most recreationists on the creek were readily observed during the use counts. Vehicle access points were checked on each count, but people were not found for some vehicles. Vehicles of U. S. Forest Service workers, loggers, and other non-recreationists often park along the road in this reach of Indian Creek, making vehicle counts a poor index of recreation use. We observed loggers, truck drivers, and U. S. Forest Service employees working along Indian Creek during the summer. We did not include them in the estimates of use because they generally did not engage in recreation along the creek. About 12 percent of the estimated fishing use was represented in the creel census.

### Comparison of 1990 Results with Previous Surveys

The first three surveys of Indian Creek (1978-80) covered the entire stream. In 1981, 1982, and 1986, the survey included only the upper 11 miles of the creek. The current survey covered the first 17 miles down to Shim Flat near Genesee Woods. A comparison of data from all seven years (Table 2) illustrates changes that have occurred in general recreation, fishing, and angler success in the upper reach (Antelope Dam to Flournoy Bridge).

Two events probably reduced overall use for the year. Due to high fire hazard, the U. S. Forest Service prohibited campfires outside designated areas between July 1 and September 28. Thus, it was illegal to have a campfire along the creek during this period.

The Forest Service temporarily closed small areas of forest and stream to protect recreation users from the danger of debris falling from a timber salvage helicopter operation. The limited access was in force from April 30 through August 1, and several times in June and July the entire upper creek was closed to camping. However, logging operations seemed to affect fishing less than other activities.

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Table 2. Estimated Recreation Hours by Activity,  
Upper Indian Creek, 1978-82, 1986 and 1990<sup>1/</sup>

Activity	Year						
	1978	1979	1980	1981	1982	1986	1990
Fishing	7,000	3,400	8,800	3,600	13,500	7,600	6,200
Camping	5,600	7,700	8,000	4,500	14,500	9,700	5,700
Relaxing	4,200	5,200	2,600	2,000	3,000	5,300	1,300
Picnicking	300	500	700	800	1,400	200	100
Gold Seeking	300	200	400	1,600	600	1,900	1,300
Miscellaneous	<u>1,200</u>	<u>1,000</u>	<u>1,700</u>	<u>1,000</u>	<u>2,600</u>	<u>2,300</u>	<u>1,100</u>
Total	18,600	18,000	22,200	13,500	35,600	27,000	15,700

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<sup>1/</sup> Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, 83-1, 87-1 and this report. This table includes only data for the upper 11 miles of Indian Creek, Antelope Dam to Flournoy Bridge.

Seven years of surveys, a period that included a wide range of streamflow conditions, have revealed that angling success is higher and more anglers are attracted to Indian Creek in years when Antelope Reservoir spills and summer flows are maintained at 20 cfs, than in years with low flows (Table 3). Anglers know that rainbow trout leave the reservoir when it spills and fishing will be good downstream. The catch per hour and total catch of rainbow trout roughly reflect the number of trout entering the stream at the time of spill. Fishing success for brown trout remains about the same irrespective of angling pressure. After spill ends, the higher maintained flows

make the stream appear better for fishing and increased angler use continues. Higher use then results in even more trout caught.

Table 3. Streamflow and Estimated Angler Use and Catch  
Upper Indian Creek, 1978-82, 1986 and 1990<sup>1/</sup>

<u>Year</u>	<u>Streamflow Conditions</u>	<u>Angler Hours</u>	<u>Brown Trout</u>		<u>Rainbow Trout</u>		<u>Total Trout</u>	
			<u># BN Caught</u>	<u>Catch/ Hour</u>	<u># RT Caught</u>	<u>Catch/ Hour</u>	<u># Trout Caught</u>	<u>Catch/ Hour</u>
1978	Spill 46 days and 20 cfs	7,000	3,465	0.50	1,400	0.20	4,865	0.70
1979	Spill 20 days and 10 cfs	3,400	1,330	0.39	410	0.12	1,740	0.51
1980	Spill 177 days and 20 cfs	8,800	2,950	0.34	2,835	0.32	5,785	0.66
1981	No spill and 10 cfs	3,600	1,400	0.39	200	0.05	1,600	0.44
1982	Spill 237 days and 20 cfs	13,500	4,300	0.32	4,780	0.35	9,080	0.67
1986	Spill 123 days and 20 cfs	7,600	2,700	0.35	2,500	0.33	5,200	0.68
1990	No spill and 10 cfs	6,200	2,120	0.34	1,830	0.30	3,950	0.64

<sup>1/</sup> Source: DWR Technical Information Report Nos. 79-1, 80-1, 81-1, 82-1, 83-1, 87-1 and this report. This table includes only data for the upper 11 miles of Indian Creek, Antelope Dam to Flournoy Bridge.

The seven years of survey data have defined Indian Creek recreation and fishing quite well and also provided some interesting incidental information. Use is normally heaviest in the spring months and about 50 percent of the annual recreation and 75 percent (only 66 percent in 1990 due to access closures) of the fishing occurs by the end of June. The major activities are typically camping, fishing, and relaxing. Overall, the best fishing occurs before July. Fishing is

usually best in the morning hours (before noon for both rainbow and brown trout, although evening fishing (after 4 p.m.) for brown trout is nearly as good. Morning and evening periods nearly always provide better fishing than mid-day.

Most of the exceptionally large fish observed in the creel census are caught on the opening weekend or early in the season. The opening weekend always has the highest angling use of the year, (typically 15-20 percent of the annual use) but often not the highest fishing success.

Local anglers (Plumas and Lassen County residents) who presumably know Indian Creek better than other anglers are somewhat more successful in catching trout than residents of other counties.



## ACKNOWLEDGEMENTS

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Thanks to Mike Serna for preparing the graphs and Lori Miles who typed the text and tables.

## REFERENCES

- Abramson, Norman, and Joyce Tolladay. "The Use of Probability Sampling for Estimating Annual Number of Angler Days". California Department of Fish and Game. 45(4):303-311. 1959.
- Brown, Charles. 1978. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1977". Bay-Delta Fishery Study, Contract Services Section Information Report 78-1. Department of Fish and Game. 16 pp.
- Brown, Charles, and Sharon Haines. 1979. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1978". Bay-Delta Fishery Study, Contract Services Section Information Report 79-2. Department of Fish and Game. 23 pp.
- Bumpass, Dawn Kori, and Karen Smith. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1982". Contract Services Section, Bay-Delta Fishery Study, Department of Fish and Game. 23 pp. 1989A.
- \_\_\_\_\_. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1986". Contract Services Section, Bay-Delta Fishery Project, Department of Fish and Game. 27 pp. 1989B.
- \_\_\_\_\_. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1987". Contract Services Section, Bay-Delta Fishery Project, Department of Fish and Game. 29 pp. 1989C.
- \_\_\_\_\_. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1988". Contract Services Section, Bay-Delta Fishery Project, Department of Fish and Game. 27 pp. 1989D.
- \_\_\_\_\_. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1989". Contract Services Section, Bay-Delta Fishery Project, Department of Fish and Game. (MS) 29 pp. 1990.
- Cartier, Emmett A. "Recreation Use Survey of Indian Creek, Plumas County, 1978". Department of Water Resources, Northern District Technical Information Report No. 79-1. 28 pp. 1979.
- Department of Water Resources. "Preliminary Study of Instream Enhancement Opportunities". Division of Planning. 113 pp. (pp. 102-113, North Fork Feather River.) 1979.
- Gerstung, Eric R. "Fish Population and Yield Estimates from California Trout Streams". Cal-Neva Wildlife. pp. 9-19. 1973.

- Haines, Sharon L. "Recreation Use Survey of Indian Creek, Plumas County, 1979". Department of Water Resources, Northern District Technical Information Report No. 80-1. 29 pp. 1980.
- \_\_\_\_\_. "Recreation Use Survey of Indian Creek, Plumas County, 1980". Department of Water Resources, Northern District Technical Information Report No. 81-1. 29 pp. 1981.
- \_\_\_\_\_. "Indian Creek Flow Study". Department of Water Resources, Northern District Technical Information Report No. 81-2. 18 pp. 1981.
- Haines, Sharon L., and Charles Brown. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1979". Department of Fish and Game, Bay-Delta Study, Contract Services Section Information Report No. 80-1. 23 pp. 1980.
- Hinton, Ralph N. "Recreation Use Survey of Indian Creek, Plumas County, 1981". Department of Water Resources, Northern District Technical Information Report No. 82-1. 16 pp. 1982.
- \_\_\_\_\_. "Recreation Use Survey of Indian Creek, Plumas County, 1982". Department of Water Resources, Northern District Technical Information Report No. 83-1. 18 pp. 1983.
- Hinton, Ralph N., and Sharon L. Haines. "Evaluation of a Revised Operation for Antelope Reservoir". Department of Water Resources, Northern District Report. 58 pp. 1981.
- Tittel, Jerry D. "Recreation Use Survey of Indian Creek, Plumas County, 1986". Northern District Technical Information Report No. 87-1. Department of Water Resources. 18 pp. 1987.
- Villa, Nick A. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1981". Department of Fish and Game, Bay-Delta Study, Contract Services Section Information Report No. 82-1. (MS) 23 pp. 1982.
- Villa, Nick A., and Charles J. Brown, Jr. "Standing Stocks of Fishes in Sections of Indian Creek, Plumas County, 1980". Bay-Delta Fishery Study, Contract Services Section Information Report 81-1. Department of Fish and Game. 23 pp. 1981.

# APPENDIX I

## RECREATION SURVEY SCHEDULE FOR INDIAN CREEK, PLUMAS COUNTY APRIL 28, 1990, TO NOVEMBER 15, 1990

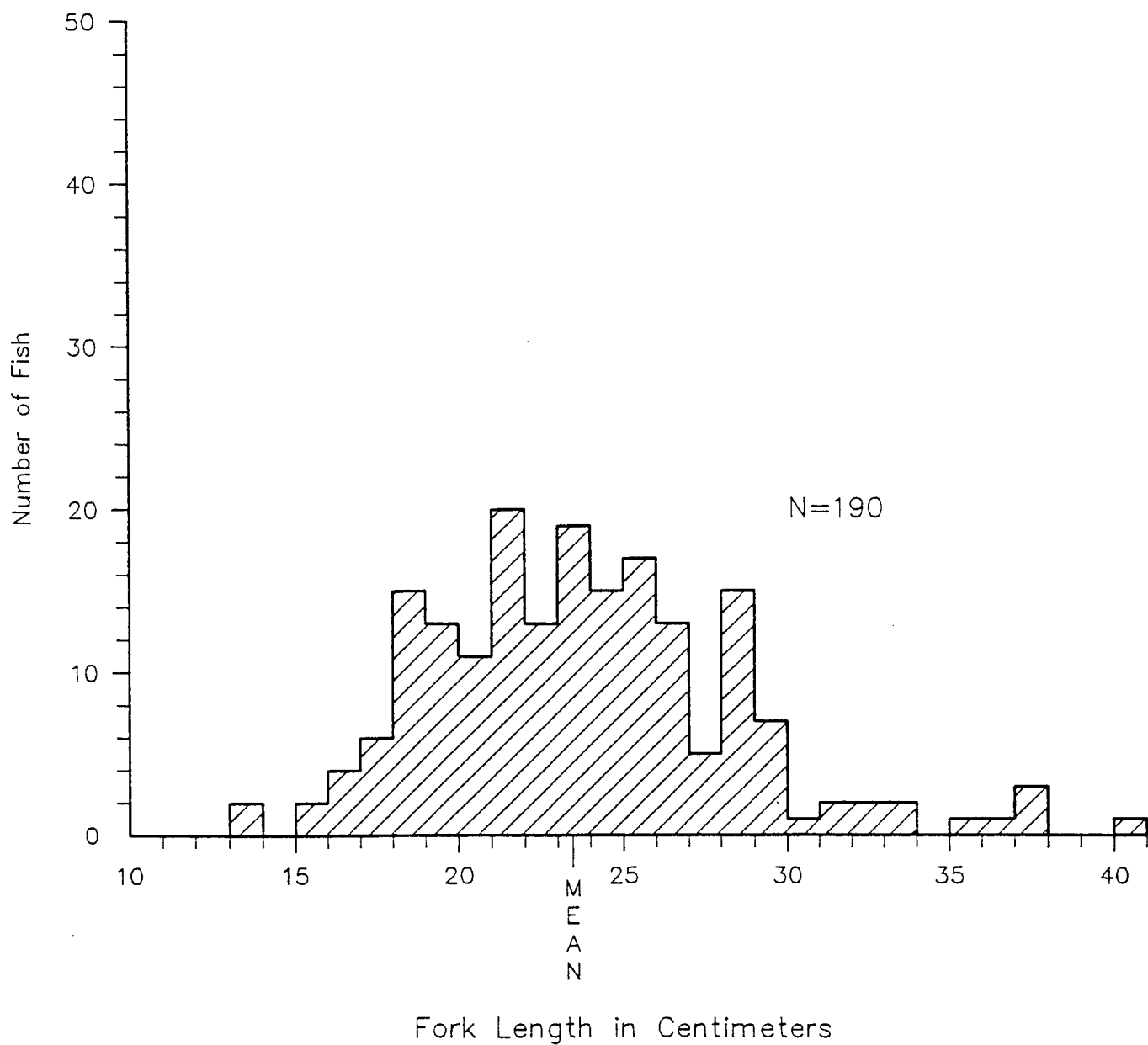
<u>Indian Creek Survey Dates</u>	Holiday = HD Weekend = WE <u>Weekday = WD</u>	<u>Survey Strata</u>
April 28	WE	I
April 29	WE	I
May 1	WD	IV
May 5	WE	III
May 15	WD	IV
May 17	WD	IV
May 22	WD	IV
May 26	HD	II
May 27	HD	II
May 28	HD	II
June 2	WE	III
June 9	WE	III
June 17	WE	III
June 22	WD	IV
June 27	WD	IV
July 4	HD	IX
July 5	WD	VI
July 12	<del>WE</del> <sup>VO</sup>	VI
July 28	<del>WD</del> <sup>WE</sup>	V
July 29	WE	V
August 7	WD	VI
August 15	WD	VI
August 26	WE	V
August 31	WD	VI
September 1	HD	IX
September 11	WD	VIII
September 21	WD	VIII
October 20	WE	VII
November 4	WE	VII

# APPENDIX II

## 1990 USE COUNT SCHEDULE FOR INDIAN CREEK

<u>Date</u>	<u>Daylight Hours</u>	<u>Use Count</u>		<u>Creel Census Time (approx.)</u>
		<u>Count</u>	<u>Time</u>	
April 28-29 PDT	15-1/2	1st	0730-0830	0800-1200
		2nd	1000-1100	1500-1900
		3rd	1300-1400	
		4th	1530-1630	
		5th	1830-1930	
May-August PDT	16-1/2	1st	0700-0800	0800-1300
		2nd	1000-1100	1400-1900
		3rd	1300-1400	
		4th	1600-1700	
		5th	1900-2000	
September PDT	14	1st	0730-0830	0900-1300
		2nd	1000-1100	1400-1800
		3rd	1230-1330	
		4th	1500-1600	
		5th	1730-1830	
October PDT	13	1st	0800-0900	0900-1300
		2nd	1000-1100	1400-1800
		3rd	1230-1330	
		4th	1500-1600	
		5th	1700-1800	
November PST	12	1st	0730-0830	0800-1200
		2nd	0930-1030	1300-1700
		3rd	1130-1230	
		4th	1330-1430	
		5th	1530-1630	

Appendix III  
 Length Frequency of Censused  
 Brown Trout, Indian Creek,  
 1990



Appendix IV  
Length Frequency of Censused  
Rainbow Trout, Indian Creek  
1990

